

# ***ANACAPA ISLAND RESTORATION PROJECT***

## ***CHAPTER TWO ALTERNATIVES***

### **Chapter Contents**

|   |    |
|---|----|
| INTRODUCTION .....  | 11 |
| ALTERNATIVE DEVELOPMENT PROCESS .....                             | 11 |
| Internal Scoping and Public Involvement .....                     | 11 |
| Significant Environmental Issues .....                            | 12 |
| <i>Issue 1: Efficacy on Target Population</i> .....               | 12 |
| <i>Issue 2: Impact to Non-Target Species</i> .....                | 12 |
| Sub-issue 1 - Marine Mammals .....                                | 13 |
| Sub-Issue 2 - Invertebrates (Marine/Terrestrial) .....            | 13 |
| Sub-Issue 3 - Marine Fishes .....                                 | 14 |
| Sub-Issue 4 - Herpetofauna .....                                  | 14 |
| Sub-Issue 5 - Seabirds .....                                      | 14 |
| Sub-Issue 6 - Landbirds .....                                     | 14 |
| Sub-Issue 7 - Mammals (Terrestrial) .....                         | 15 |
| Sub-Issue 8 - Flora .....   | 15 |
| <i>Issue 3: Public Safety and Visitation</i> .....                | 15 |
| ALTERNATIVES CONSIDERED IN DETAIL .....                           | 16 |
| INTRODUCTION .....  | 16 |
| FEATURES COMMON TO ALL ACTION ALTERNATIVES .....                  | 16 |
| Effectiveness and Validation Monitoring .....                     | 16 |
| Non-native Rodent Introduction Prevention Plan .....              | 17 |
| Protection of Native Deer Mouse Population .....                  | 17 |
| Rat Detection Response Plan .....                                 | 18 |
| Human Health .....  | 18 |
| Timing .....  | 18 |
| Permits and Approval .....  | 18 |
| Public Awareness .....  | 18 |
| Visitation Restriction .....                                      | 18 |
| ALTERNATIVES .....  | 19 |
| ALTERNATIVE ONE - NO ACTION .....                                 | 19 |
| ALTERNATIVE TWO - PROPOSED ACTION AND PREFERRED ALTERNATIVE ..... | 19 |
| ALTERNATIVE THREE .....   | 20 |
| ALTERNATIVE FOUR .....  | 22 |
| ALTERNATIVE FIVE .....  | 23 |
| ALTERNATIVE SIX .....   | 24 |
| ALTERNATIVES CONSIDERED AND REJECTED .....                        | 26 |
| BAIT STATIONS .....   | 26 |
| ELEVATED BAIT STATIONS .....                                      | 26 |
| ALTERNATE RODENTICIDES .....                                      | 26 |
| TRAPPING .....  | 28 |
| INTRODUCING PREDATORS .....                                       | 29 |
| SUMMARY OF ALTERNATIVES .....                                     | 29 |

## *Introduction*

This chapter describes the six alternatives to be considered for implementation and identifies the significant environmental issues used to formulate these alternatives. The environmental issues were developed as a result of extensive “scoping” conducted for this analysis. The “scoping” actions that were conducted for this analysis are described in detail. In addition, this chapter includes the rationale for dismissing other methods/alternatives from further consideration. Chapter Four concludes with a comparison of alternatives.

## *Alternative Development Process*

Section 102(e) of NEPA states that all Federal agencies shall “study, develop, and describe appropriate alternatives to recommend courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources”. In addition to responding to unresolved conflicts, an EIS must “rigorously explore and objectively evaluate all reasonable alternatives” [40CFR 1502.14(a)].

Taken together, these requirements determine the range of alternatives and provide the basis for the Deciding Official’s informed decision, as required under NEPA. The Proposed Action, as stated in Chapter One, was the result of a resource analysis done by NPS resource management staff in collaboration with rodent eradication experts from the Island Conservation and Ecology Group (ICEG). This collaborative effort identified management actions necessary to respond to rat impacts on the Anacapa Island ecosystem.

The alternatives detailed below were developed to focus on the issues identified by resource specialists with the NPS, rat eradication experts and other rodent control experts, government regulatory agencies, and the general public. Chapter Five – Consultation and Coordination lists all individuals, agencies and organizations that provided substantive comment regarding the proposed action.

## *Internal Scoping and Public Involvement*

The NEPA “scoping” process [40CFR 1501.7] was used to determine the scope of the analysis and to identify potential issues and opportunities related to the Proposed Action. A summary of the scoping and public involvement process for the proposed project and for the release of the Draft EIS is summarized in Chapter Five.

Below is a summary of the scoping that was conducted to identify the environmental issues to be considered for this project.

### *Proposed Action Internal Scoping*

The Park has an extensive record of controlling rats on East Anacapa Island. Through these efforts, the Park has collectively gained knowledge about the issues surrounding the presence of rats on the island. In addition, the Park has funded scientific studies that focus on the ecology and control of rats within the Park.

### *Proposed Action External Scoping*

External scoping refers to the effort the Park made to solicit input from the local public, organizations, other government regulatory agencies. A complete summary of the Park’s scoping efforts can be found in Chapter Five.

The methods the Park used to solicit input included:

- **Scoping Letter:** A letter describing the proposed action was sent to individuals and organizations who expressed interest in the Park's management, and government agencies who might have oversight/regulatory concerns about the project.
- **Public Meeting:** On December 8, 1999 the Park hosted a public meeting. The Park paid for ads in three local newspapers announcing the meeting (Los Angeles Times, Ventura County Star, Santa Barbara Newspress). As part of this meeting the Park presented the need for the proposed action as well as the proposed action.
- **Presentations:** The Park made presentations to several local organizations.
- **Website:** The Park posted information regarding the project on its website.
- **Direct Communication:** The Park made direct communication to regulatory government agencies who may have oversight concerns regarding the project. A list of these agencies can be found in Chapter Five.

## ***Significant Environmental Issues***

Through the Scoping and Public Involvement Process the following significant environmental issues were identified. Significant issues are those that may require project-specific alternatives, mitigation measures or design elements to address the potential effects of the proposed activities.

The issues are grouped into three broad categories. Because these are broad categories, the "Non-target Impacts Issue" category will contain a number of sub-issues. Each issue

category (-and/or sub-issue-) contains a summary statement that defines the scope of the issue for this project. In addition, for each issue category (and/or sub-issue), measurement indices are given to provide a preview of how the issue will be evaluated for direct, indirect, and cumulative effects for each alternative. The "Issue" categories are as follows:

- **Issue 1: Efficacy on Target Species**
- **Issue 2: Non-Target Impacts**
- **Issue 3: Public Safety and Visitation**

### ***Issue 1: Efficacy on Target Population***

Efficacy for this analysis is defined as how well the alternative would meet the 100% eradication objective.

#### Measurement Indices

- Chemical and toxicological properties of the rodenticide
- Composition of the bait and how it is applied
- Local environmental factors.

### ***Issue 2: Impact to Non-Target Species***

Chapter Four (Environmental Consequences) will analyze both the potential for exposure of non-target species to rodenticide residues and any physical disturbance from normal activities of non-target species caused by implementation of the project.

Physical disturbance may occur due to baiting activities, and crews walking around the island. For example, *Malacothrix squalida*, a listed species (endangered) under the endangered Species Act is located in the project area. As such the Park is required to consult with the USFWS on potential impacts the project may have on the species. Physical disturbance from monitoring

activities is the only potential impact that may occur to this species

Rodenticide exposure, for the purpose of this analysis, can occur through direct bait consumption (primary exposure), secondarily (via carcasses containing rodenticide residues) and possibly tertiary exposure. Primary exposure occurs when organisms feed directly on the bait. Secondary exposure occurs when animals feed on primarily exposed organisms with residues in their tissue. Tertiary exposure is possible, through consumption of a secondarily exposed organism, but has not been thoroughly documented in the literature (Eason and Murphy 1999). For the purpose of this analysis, only primary and secondary exposure will be evaluated.

The first step in the process to determine which non-target species may be impacted by the proposed action was to identify all the known species within the project area. The species were then placed in a taxonomic classification to identify logical groups of species. Based on the risk assessments for the rodenticide (and other scientific studies) the groups of species that may be impacted were identified. These identified groups (See Table 1) will be carried forward in the analysis as “Sub-Issues”.

The taxonomic classification for identification of sub-issues is necessary to provide a logical layout of “effects” when evaluating toxicological risk. This is because the toxicology of these rodenticides is consistent within the groups that have been identified. The sub-issues as derived from Table 1 is as follows:

### ***Sub-Issue 1: Marine Mammals***

Two pinniped species (harbor seals, *Phoca vitulina*, and California sea lions, *Zalophus californianus*) haul out on the rocks and beaches around Anacapa Island. Harbor seals breed on the island between January and March. Both species may be disturbed by the baiting activities and possibly by some of the monitoring

activities. Efforts would be made to minimize

Table 1. Project Area Species Taxonomic Classification

|     |   |
|-----|---|
| I.  | Marine  |
| A.  | Mammals (Sub-Issue 1)                               |
| B.  | Invertebrates (Sub-Issue 2)                         |
| C.  | Fishes (Sub-Issue 3)                                |
| II. | Terrestrial   |
| A.  | Fauna   |
| 1.  | Invertebrates (*combined with Sub-Issue 2)          |
| 2.  | Herpetofauna (Sub-Issue 4)                          |
| 3.  | Avian   |
| a.  | Seabirds (Sub-Issue 5)                              |
| b.  | Landbirds (Sub-Issue 6)                             |
| 4.  | Mammals (Sub-Issue 7)                               |
| B.  | Flora ( <i>Malacothrix squalida</i> ) (Sub-Issue 8) |

drift of bait into the marine environment; however, if bait does enter the ocean, marine mammals may be at risk of rodenticide exposure.

### ➤ Measurement Indices

- Exposure to Residues – the effects discussion will focus on how the proposed action and alternatives would expose the marine mammals to rodenticide residues.

### ***Sub-Issue 2: Invertebrates (Marine/Terrestrial)***

Terrestrial invertebrates on Anacapa Island would likely consume carcasses of vertebrates exposed to the rodenticide, as well as any residual bait not consumed. Thus, there is potential for the transfer of residues into the food chain.

Rodenticide may enter the marine food chain if bait incidentally drifts into the intertidal/subtidal areas and is consumed by marine intertidal invertebrates.

- Measurement Indices
- Exposure to Residues – the effects discussion will focus on how the proposed action and alternatives will expose the invertebrate populations to rodenticide residues, and, will analyze those predators at risk.

### ***Sub-Issue 3: Marine Fishes***

The relative exposure of gamefish to the rodenticide is small; however, there is a risk of incidental drift of bait into the marine environment thus presenting a primary and possible secondary exposure risk.

#### Measurement Indices

- Exposure to Residues – the effects discussion will focus on how the proposed action and alternatives would expose gamefish to the rodenticide via bait ingestion using recent studies with placebo baits.

### ***Sub-Issue 4: Herpetofauna***

Anacapa is home to two species of reptiles, the Side-blotched lizard (*Uta stansburiana*) and the Southern Alligator lizard (*Elgarramulticarinata*), and one species of salamander – the Channel Islands Slender Salamander (*Batrachoseps pacificus*). These species are subject to primary and secondary exposure risk.

- Measurement Indices
- Exposure to Residues – The effects discussion will focus on how the proposed action and alternatives would impact lizards and amphibian populations, with emphasis on population level impacts and inclusion

of results from eradication programs elsewhere.

### ***Sub-Issue 5: Seabirds***

For the purpose of this analysis, the seabirds have been subdivided into two groups: the pelagic seabirds and roosting seabirds. The pelagic seabirds are those birds that reside offshore from Anacapa Island and only utilize the island for breeding, outside of the proposed baiting period. The roosting seabirds are those that utilize Anacapa for roosting during the proposed baiting period.

#### ➤ Measurement Indices

##### ➤ Federally Endangered Seabirds –

Roosting and nesting habitat for the endangered Brown Pelican exists within the analysis area. The effects discussion will describe how the proposed action and alternatives to the proposed action affect the Brown Pelican.

##### ➤ Disturbance – the effects discussion in the effects will focus on how the proposed action and alternatives would disturb seabirds.

##### ➤ Exposure to Residues – The effects discussion will focus on how the proposed action and alternatives would impact seabirds, with results from recent studies completed on Anacapa Island.

### ***Sub-Issue 6: Landbirds***

Some species of landbirds utilize Anacapa Island seasonally and others year round. For the purpose of this analysis, the landbirds have been divided into two groups: the birds of prey, (raptors); and passerines. Birds of prey are at risk of secondary exposure through consumption of primarily exposed organisms. The Passerines were subdivided further based on foraging strategy (i.e. omnivorous, insectivorous, and

granivorous). While the insectivorous passerines are at risk of secondary exposure and the granivorous are at risk of primary exposure, the omnivorous passerines are at risk of both primary and secondary exposure.

➤ Measurement Indices

- Exposure to Residues - The effects discussion will describe how the proposed action and alternatives to the proposed action may affect individual birds of prey and passerines.

***Sub-Issue 7: Mammals***

The endemic subspecies (unique to Anacapa Island) of the Deer Mouse (*Peromyscus maniculatus anacapae*) co-exists on Anacapa Island with the introduced rats. Mice share many characteristics with rats and thus, are at a high risk of primary exposure.

➤ Measurement Indices

- Exposure to Residues – The effects discussion will focus on how the proposed action and alternatives would impact the Deer Mouse population, with emphasis on population level impacts and include the results of rodent control operations elsewhere.

***Sub-Issue 8: Flora***

The endangered Island Malacothrix (*Malacothrix squalida*) is an annual herb from the aster family. It is found on Santa Cruz Island and Middle Anacapa Island. This annual occurs on rocky coastal bluffs in coastal scrub (Junak et al. 1995). On Middle Anacapa Island the distribution is very limited. It is found in two locations, near the east and west end of Middle Anacapa Island. The presence of island malacothrix makes it highly susceptible to trampling from personnel walking on the island.

➤ Measurement Indices

- Trampling – The effects discussion will focus on how the proposed action and alternatives would impact the island malacothrix population, with emphasis on mitigation against damage.

***Issue 3: Public Safety and Visitation***

Anacapa Island is the most visited of all islands in the Channel Islands National Park. Visitors are only allowed access to East Island and Frenchy's Cove on West Island. East Island receives both day visitors and overnight campers. With the high visitation to the islands by the public there are two concerns: 1) potential exposure of the public to the rodenticide; and 2) impacts to visitors from closing the island during operations of the AIRP.

➤ Measurement Indices

- Exposure to Residues: The effects discussion will focus on how the proposed action and alternatives would potentially expose the visiting public to the rodenticide, as well as the associated health risks of exposure.
- Visitor Impacts: The effects discussion will focus on how the proposed action and alternatives would potentially impact visitors' enjoyment of the Park during AIRP operations.

***Issues Dismissed from Analysis***

The analysis considered the social impacts of implementing the proposed project. The analysis concluded that the proposed project would not change the local population's work, recreation, or social interactions. As such, executive order 12898 (environmental justice) does not apply to this analysis.

Similarly, this analysis does not affect floodplains (EO1508.27), or sacred sites

(EO13007). The Park has also determined that this analysis does not require analysis of energy requirements (1502.16), nor does it require a economic impact analysis (EO11821)

## *Alternatives Considered in Detail*

### ***Introduction***

Development of the alternatives was strongly influenced by the significant environmental issues. In developing the alternatives, the Park consulted many outside experts in the field of vertebrate biology, toxicology, and avian biology. In addition to the six alternatives described below, many other alternatives were considered, but were eliminated from further study. These alternatives, along with the rationale for their dismissal, can be found at the end of this chapter under the heading, “Alternatives Considered but Dismissed”. Because of the specific objective of this project, many alternatives were dismissed because they could not meet the objective of total eradication.

Eradicating rats from Anacapa Island, and the eradication of rats as a result of an accidental introduction are two distinct, but inter-related activities. The former comprises the actions being proposed for the eradication of the known and long-term persistent rat population on Anacapa Island. The latter comprises the activities that are being considered in response to the accidental introduction of rats to islands within the Park.

### ***Features Common to All Action Alternatives***

#### ***Effectiveness and Validation Monitoring***

Effectiveness and validation monitoring would be required to be done for each action alternative prior to final treatment of Middle and West Islets. Effectiveness monitoring would be conducted to determine if the alternative’s prescription is effective in meeting the stated eradication objective. Validation monitoring would be conducted to determine if the environmental effects of implementing the management action (including mitigation measures) are similar to the effects predicted in the EIS.

For each alternative, eradication would begin with baiting (consistent with the alternative) in a representative habitat within the project area. Representative habitat would be limited to East Islet as a whole, or a smaller area on Middle Islet.

Analysis of monitoring data would be done prior to proceeding with final treatment of Middle and West Islets. Evaluation of monitoring results would determine whether to:

- Modify the eradication activities
- Continue the proposed eradication activities

Monitoring results that lead to a modification of the project may require a supplemental EIS. The supplemental EIS and subsequent decision would need to be prepared prior to resumption of eradication activities. A supplemental EIS is necessary when substantial new information is discovered, and/or when change of activities result in substantial change in environmental effects that were not previously analyzed in the EIS.

Monitoring results that are consistent with the analysis provided in the FEIS would allow

for the continuance of the proposed eradication activities without additional environmental compliance.

### ***Non-native Rodent Introduction Prevention Plan***

To minimize the risk of rodent introductions to the Channel Islands, a set of standards would be implemented by the Park. The minimum proposed prevention actions, which would become the Park's prevention plan, are as follows:

- 1) Rodent-proof storage areas.
- 2) Rodent-proof containers that haul equipment and supplies to the Islands.
- 3) Control rodents at all departure points, including planes, boats, and helicopters that transport people and materials to the Islands.
- 4) Inform and educate all people who visit the islands. This includes visitors, concessionaires, contractors, employees, permittees, and researchers.

### ***Protection of Native Deer Mouse Population***

The presence of the endemic Anacapa Deer Mouse represents a unique challenge to rat eradication. The conservation and management of Anacapa Island Deer Mice is a high priority for the AIRP. The genetic and morphological status of the Anacapa Deer Mouse has been investigated using genetics, morphometrics and computer modeling (Pergams et al. 2000). The results of this study has confirmed that the Anacapa Deer Mouse is a distinct subspecies that is genetically identical across all three islets. Thus, the Deer Mouse population can be managed as a whole population (one "evolutionarily significant unit" (ESU)) rather than a distinct population on each islet. Further, to maintain genetic diversity and ensure a viable population, 1000 mice across all

three islets would need to be protected (Pergams et al. 2000). Management actions to protect the Deer Mouse population will include a protection plan that will be implemented prior to the eradication efforts. Consultation with *Peromyscus* and genetic experts from the Brookfield Zoo, Illinois and the University of Illinois is underway to develop a protection plan that will maintain genetic diversity and ensure a viable population of mice on each islet post eradication. The Effectiveness and Validation Program will aid in the development of an effective protection plan for the Anacapa Deer Mouse because it will identify problem areas that would allow changes to the final Deer Mouse protection plan. The final Deer Mouse protection plan would be implemented prior to completion of the baiting. The Deer Mouse protection plan may include one or a combination of the following:

1. *Laboratory captive holding/breeding on/off island:* Mice are live captured and transported to a laboratory holding facility either on island or on the mainland. About 350 mice from each islet are captured from each island and held. They would be released back on to the island over time.
2. *Move mice between islands:* Mice are moved from Middle and/or West Island to East Island in between treatment of East and Middle/West Islands. Thus, a viable population of mice are available on East Island for restocking Middle and West Islands after eradication.
3. *Fenced enclosures:* Mice are maintained in a fenced enclosure where rats are prevented from entering, and mice are prevented from entering or leaving. A complement of mice are maintained with rodent chow and water for a determinant period of time. Mice are released over time from the enclosure back into the Anacapa environment, restocking the island. The enclosure area would not be treated.

### ***Rat Detection Response Plan***

Reacting to a “rat-spill” from a shipwreck or some other introduction requires a rapid response, as does any appearance of rats on Anacapa Island following eradication, or on Prince, Sutil and Santa Barbara Islands. In the event of a shipwreck the Shipwreck Response Plan is a decision pathway to implement the Rat Detection Response Plan (Appendix A) – a plan to evaluate the extent of rodent introduction and implement an appropriate response. The Rat Detection Response Plan would be implemented if rats were introduced to the islands via shipment of goods or equipment.

### ***Human Health***

A buffer of approximately 10 meters around the campground, buildings and landing area on East Island would be established. This buffer would not be aerially treated, although, a perimeter of bait stations would be established approximately every 10-15 m. Each station would be uniquely labeled to identify its location. An appropriate warning label such as: “Anacapa Island Restoration Project. Rat Poison – Danger, Do Not Disturb. Contact Park Ranger or telephone 805-658-5720” on each station and a copy of the product label would also be included at each of these bait stations for reference.

### ***Timing***

To minimize both disturbance and potential ecotoxicological impacts, bait application would be restricted to September through December of each year.

The late fall period offers the optimum time to apply the bait for the following reasons: 1) endangered Brown Pelicans are not breeding on the island; 2) the rats are in decline due to food stress and therefore would eat the bait more readily; and 3) the onset of the rainy season

would expedite the degradation of any residual bait not consumed by the target species.

Splitting the treatment of the islands into two years is beneficial for several reasons. First, it allows monitoring for efficacy, i.e. evaluate the feasibility of eradication at the maximum of 15 kg/ha sowing rate, and modify and improve operational procedures for year 2. Secondly, the Park can monitor impacts to non-target species on a smaller scale to identify further necessary mitigation measures.

### ***Permits and Approval***

EPA registration and approval would be required for implementation of any of the alternatives considered in this analysis (except the No Action alternative). Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), use of a non-registered rodenticide requires approval from the Federal EPA. A site-specific application label would be prepared for the AIRP project. Consultation and registration with the EPA is required before application.

### ***Public Awareness***

Posters outlining the project and warning visitors of the activities on the island would be posted on the mainland at the visitor center, on island at the landing cove and at the visitor center at East Anacapa Island.

### ***Visitation Restriction***

The operations of the eradication program will require that visitation be restricted for a short period. East Anacapa Island will be closed to all visitors for approximately 2-3 days. The restriction is necessary to allow the operations crews to implement the baiting operation including helicopter activity, evaluation, and monitoring of the environment.

After the operations are complete, the island will be open to day use visitors. East Anacapa

will be closed to campers for approximately 5 days because the campground will be used for housing the post treatment monitoring crews.

## ***Alternatives***

### ***Alternative One***

#### ***No Action***

Alternative One (no action) continues the existing rat management strategy on Anacapa Island. Implementation of this alternative would occur assuming that future Park budgets are similar to recent budgets. Analysis of the alternative is a requirement of the National Environmental Policy Act (NEPA) and National Park Service planning procedures.

The existing management strategy for managing the species *Rattus rattus* on Anacapa Island is found in the Park's General Management Plan. Specifically, the GMP states, "Based on research and experimentation, programs will be implemented to reduce to the extent feasible the impacts of introduced plant and animal species." From the late 1980's through the early 1990's, concentrated control activity occurred on Anacapa Island. This consisted of widely spaced, elevated bait stations using the rodenticide Warfarin. Since that time the Park has concentrated control efforts around the existing structures on East Island. No control measures have been taken outside of these areas due to budget, personnel, and compliance constraints.

### ***Alternative Two (Preferred Alternative)***

#### ***Aerial broadcast of a Rodent Bait Containing Brodifacoum***

##### Summary

This alternative outlines the use of a rodent bait aerially broadcast from a hopper suspended under a helicopter, and broadcast by hand.

East Islet baiting would occur during the Nov/Dec treatment window and would be treated along with approximately 20 ha of Middle Islet to lower the probability of invasion by rats from Middle Islet to East Islet. The 20 ha section of Middle Islet may be treated intermittently to prevent re-invasion of East Islet. Middle Islet (including the section treated with East Islet ) and West Islet would be treated during the application window of November thru December in the year following East Islet application. Bait would be applied in the following formulation:

Active Ingredient: Brodifacoum

Concentration of Active Ingredient: 25 ppm Brodifacoum

Rate of application: Bait would be broadcast at a maximum rate of 15 kg /ha

Application: Application would be completed by hand or aerial broadcast across 100% of the area of the islands. Hand broadcast would be carried out by or under the supervision of licensed applicators spreading bait by hand. Aerial broadcast would be carried out utilizing a hopper (dry slinger) suspended from a helicopter flying along a predetermined pathway programmed into a Differential GPS. Aerial baiting would be carried out using a licensed pesticide applicator.

Top of Island: Bait would be spread from a hopper suspended under a helicopter. The helicopter would fly at approximately 50 knots, approximately 25-50 m aboveground with the

hopper open and spreading bait. To ensure even coverage, the island would be flown twice: once in an East-West direction sowing at half the rate, then again on a North-South direction sowing bait at half the rate. Bait would be spread from the hopper in a 360-degree pattern. The number of passes over the island would be determined by the swath width which is a function of size of the bait pellet and speed with which it is propelled out of the hopper.

Cliffsides: Every effort would be made to prevent bait from drifting into the marine environment. The helicopter would fly along the top cliff edge to minimize drift of bait into the marine ecosystem. The helicopter also would be used to “trickle” bait to the larger offshore rocks with the helicopter hovering low, hopper turned off- gate open to ensure adequate coverage. In some cases, bait would be hand broadcast onto the cliffsides from above. In the cases of hard-to-reach offshore rocks and lower reaches of cliffsides, travel by boat for hand broadcast may be required.

Number of applications: A maximum of two applications is anticipated.

#### Timing

- Years 1-2: Initiate eradication by baiting in representative habitat during the November-December application window (either East Islet as a whole, or smaller area on Middle Islet) and conduct implementation and effectiveness monitoring. Monitor results and determine if changes are necessary. *Year 1* activities may begin during the 2000 Nov-Dec application window given that necessary compliance measures are completed.
- Years 2-3: If monitoring results prove favorable, proceed with island-wide eradication activities.

East Islet bait broadcast including 20 ha of Middle Islet, subsequent year treatment of Middle and West Islet, including the 20 ha buffer on Middle Islet. If rats are detected on East Anacapa Island between treatment periods, the Rat Detection Response Plan may be implemented. If the problem evaluation demonstrates that rats are widespread on East Island, the whole island may be re-treated during the treatment of Middle and West Islands.

- Future: If rats are detected, the Rat Detection Response Plan would be implemented (See Appendix A).

### ***Alternative Three***

#### ***Bait Stations for Top of Island and Aerial Broadcast the Cliffsides with Brodifacoum***

##### Summary

The primary objective of this alternative is to minimize primary exposure impacts to landbirds. This alternative outlines a stratified baiting technique where bait stations would be used on top of Middle and East Islands while aerial broadcast is used on West Island and the cliffsides of East and Middle Islands. The bait stations would be armed for one year prior to treatment of West Island and cliffsides of East and Middle Islands. Under this strategy, rats would have been removed from the top of the islet for one year prior to treating the cliffsides. West Island would not be treated with bait stations because of the steep terrain and potential disturbance to pelicans with frequent visits by operators.

The top areas of East and Middle Islets would be initiated in Year 1 with deployment and arming of bait stations. In Year 2, bait stations would be checked and re-armed, while the cliffsides of East and Middle and all of West Island would be treated by hand and aerial

broadcast with a second generation anticoagulant.

Active Ingredient: Brodifacoum

Concentration of Active Ingredient: 25 ppm

Aerial Application:

- Rate of Application: maximum of 15 kg/ha
- Number of Applications: a maximum of two applications.

Bait Stations Application:

- Rate of Application: 6 bait blocks/station
- Number of Applications: re-armed until activity ceases

Bait Station Design and Construction: Bait stations would be standard lockable stations, similar to those used by professional pest control operators, but brightly colored to assist locating in dense shrubbery.

Bait Station Locations: Bait stations would be secured in place around the cliff edge at 25-50 m intervals completely encircling the top of the island. The remaining bait stations would be secured on top of the island, laid out on a grid (spacing at 50 x 50 m). Each station would be uniquely marked with a tag identifying its location and an appropriate warning such as "Anacapa Island Restoration Project: Rat Poison – Danger, Do Not Disturb. Contact Park Ranger or phone 805 658 5720".

Bait Station Arming and Checking: Each bait station would be armed on the same day once the program is initiated. Certified pesticide applicators would supervise the arming of each station with six bait blocks containing 25-ppm brodifacoum. Each station would be visited daily, checked, and bait replenished to the 6-block level as necessary until activity ceases (activity includes bait chewed or taken by rats). Data (number of blocks taken, chewed, added, or replaced) from each station would be

collected and entered into a database for analysis. When activity (bait removal or consumption) ceases, bait stations would be checked and re-armed bi-weekly then monthly for one year, documenting bait take and rat sign in stations.

Timing:

- Years 1-2: Initiate eradication by baiting as prescribed in representative habitat during the Nov-Dec application window (either East Islet as a whole, or smaller area on Middle Islet) and conduct implementation and effectiveness monitoring. Monitor results and determine if changes are necessary. *Year 1* activities may begin during the 2000 Nov-Dec application window given that necessary compliance measures are completed.
- Year 2-3: If monitoring results prove favorable, proceed with island-wide eradication activities.

Deploy and arm bait stations on the flat, accessible top of East and Middle Islets. The stations would be checked daily, and re-armed as necessary, until activity ceases. Continue monitoring stations on a bi-weekly then monthly basis. Refresh bait in stations on East and Middle Islands, aerially broadcast rodenticide bait containing 25 ppm brodifacoum on cliffsides of East and Middle Islands and the 100% aerial broadcast treatment of West Island. The application rate would be up to 15 kg/ha following procedures outlined in Alternative Two. Continue to check and re-arm bait stations at bi-monthly intervals for an additional year.

- Year 2 - Future: If rat sign is found, the Rat Detection Response Plan would be implemented (Appendix A).

## ***Alternative Four***

### ***Aerial broadcast of a Rodent Bait Containing Bromadiolone***

#### Summary

This alternative involved aerial broadcast of bromadiolone, a second-generation anticoagulant similar to brodifacoum. This alternative addresses the issue of potential impacts to non-target species.

The rodent bait would be aurally broadcast from a hopper suspended under a helicopter, and hand broadcast by workers of the Anacapa Island Restoration Project (AIRP).

The treatment of Anacapa Island would take place over a period of one year. East Anacapa would be treated in year one along with approximately 20 ha of Middle Anacapa Island to lower the probability of invasion by rats from Middle Islet to East Islet. The 20 ha section of Middle Island may be treated periodically to prevent re-invasion of East Island. Middle Island (including the section treated in year one) and West Island would be treated in year 2.

Active Ingredient: Bromadiolone

Concentration of Active Ingredient: 50 ppm

Rate of application: Bait would be broadcast at a maximum rate of 15 kg /ha.

Application: Application would be completed by hand or aerial broadcast across 100% of the area of the islands. Hand broadcast would be carried out by or under the supervision of licensed applicators spreading bait by hand. Aerial broadcast would be carried out (by a licensed pesticide applicator) utilizing a hopper (dry slinger) suspended from a helicopter flying along a predetermined pathway programmed into a Differential GPS.

Top of Island: Bait would be spread from a hopper suspended under a helicopter. The helicopter would fly at approximately 50 knots, approximately 25-50 m aboveground with the

hopper open and spreading bait. To ensure even coverage, the island would be flown twice: once in an East-West direction sowing at half the rate, then again on a North-South direction sowing bait at half the rate. Bait would be spread from the hopper in a 360-degree pattern. The number of passes over the island would be determined by the swath width which is a function of size of the bait pellet and speed with which it is propelled out of the hopper.

Cliffsides: Every effort would be made to prevent bait drifting into the marine environment. The helicopter would fly along the top cliff edge to minimize drift of bait into the marine ecosystem. The treated area would be a portion of the top of the island and the cliffsides. In some cases, hand broadcast bait onto the cliffsides from above, or travel by boat to service the offshore rocks, islands, and lower reaches of the cliffsides may be necessary. The helicopter would be used to “trickle” bait the larger offshore rocks with the helicopter hovering low, hopper turned off- gate open to ensure adequate coverage.

Number of applications: A maximum of two applications is anticipated.

#### Timing:

- Years 1-2: Initiate eradication by baiting as prescribed in representative habitat during the Nov-Dec application window (either East Islet as a whole, or smaller area on Middle Islet) and conduct implementation and effectiveness monitoring. Monitor results and determine if changes are necessary. *Year 1* activities may begin during the 2000 Nov-Dec application window given that necessary compliance measures are completed.
- Year 2-3: If monitoring results prove favorable, proceed with island-wide eradication activities.

Initiate broadcast of bait onto East Island and the 20 ha buffer of Middle Island. Initiate broadcast of bait onto Middle and West Island including the 20 ha buffer on Middle Island. If rats are detected on East Anacapa Island between year one treatment and year 2 treatment, the Rat Detection Response Plan may be implemented. If the problem evaluation demonstrates that rats are widespread on East Island, the whole island may be re-treated during the treatment of Middle and West Islands. The 20 ha section of Middle Island may be treated periodically between year one and treatment year 2 to prevent re-invasion of rats to East Island. This 20 ha section of Middle Island would be re-treated during the treatment of Middle Island.

- Year 2- Future: If rats are detected, the Rat Detection Response Plan would be implemented (Appendix A)

### ***Alternative Five***

#### ***Bait Stations for Top of Island and Aerial Broadcast the Cliffside with Bromadiolone***

##### Summary

The primary objective of this alternative is to minimize primary exposure impacts to landbirds and spatially exclude Deer Mice from gaining access to bait in stations. This alternative outlines a stratified baiting technique where bait stations would be used on top of Middle and East Islands while aerial broadcast is used on West Island and the cliffside of East and Middle Islands. The bait stations would be armed for one year prior to treatment of West Island and cliffside of East and Middle Islands. Under this strategy, rats would have been removed from the top of the islet for one year prior to treating the cliffside. West Island

would not be treated with bait stations because of the steep terrain and potential disturbance to pelicans with frequent visits by operators.

The top areas of East and Middle Islets would be initiated in Year 1 with deployment and arming of bait stations. In Year 2, bait stations would be checked and re-armed, while the cliffside of East and Middle and all of West Island would be treated by hand and aerial broadcast with a second generation anticoagulant.

##### Active Ingredient:

- Bait Stations: bromadiolone
- Aerial Broadcast: bromadiolone

Concentration of Active Ingredient: 50 ppm

##### Aerial Application:

- Rate of Application: 15kg/ha
- Number of Applications: a maximum of 2 applications is anticipated

##### Bait Stations Application:

- Rate of Application: Stations would be armed with 6 bait blocks per station
- Number of Applications: Stations would be re-armed until activity ceases.

Bait Station Design and Construction: Bait stations would be standard lockable stations, similar to those used by professional pest control operators, but brightly colored to assist locating in dense shrubbery.

Bait Station Locations: Bait stations would be secured in place around the cliff edge at 25 m intervals completely encircling the top of the island. The remaining bait stations would be secured on top of the island, laid out on a grid (spacing at 50 x 50 m). Each station would be uniquely marked with a tag identifying its location and an appropriate warning such as "Anacapa Island Restoration Project: Rat Poison – Danger, Do Not Disturb. Contact Park Ranger or phone 805 658 5720".

**Bait Station Arming and Checking:** Each bait station would be armed on the same day once the program is initiated. Certified pesticide applicators would supervise the arming of each station with six bait blocks containing 50-ppm bromadiolone. Each station would be visited daily, checked, and bait replenished to the 6 block level as necessary until activity ceases (activity includes, bait chewed or taken by rats). Data (number of blocks taken, chewed, added, replaced) from each station would be collected and entered into a database for analysis. When activity (bait removal or consumption) ceases, bait stations would be checked and re-armed bi-weekly then monthly for one year, documenting bait take and rat sign in stations.

**Timing:**

- **Years 1-2:** Initiate eradication by baiting as prescribed in representative habitat during the Nov-Dec application window (either East Islet as a whole, or smaller area on Middle Islet) and conduct implementation and effectiveness monitoring. Monitor results and determine if changes are necessary. *Year 1* activities may begin during the 2000 Nov-Dec application window given that necessary compliance measures are completed.
- **Year 2-3:** If monitoring results prove favorable, proceed with island-wide eradication activities.

Deploy and arm bait stations on the flat, accessible top of East and Middle Islets. The stations would be checked daily, and re-armed as necessary, until activity ceases. Continue monitoring stations on a bi-weekly then monthly basis. Refresh bait in stations on East and Middle Islands stations, aerially broadcast rodenticide bait containing 25 ppm brodifacoum on cliffsides of East and Middle Islets and the 100% aerial broadcast treatment of

West Island. The application rate would be up to 15 kg/ha following procedures outlined in Alternative Two. Continue to check and re-arm bait stations at bi-monthly intervals for an additional year.

- **Year 2 - Future:** If rat sign is found, the Rat Detection Response Plan would be implemented (See Appendix A).

***Alternative Six***

***Aerial broadcast of a Rodent Bait Containing Diphacinone followed by a Rodent Bait Containing Brodifacoum***

**Summary**

This alternative outlines the aerial broadcast of diphacinone, a first generation anticoagulant followed by a bait containing brodifacoum, a second-generation anticoagulant. This alternative addresses the issue of potential primary and secondary exposure impacts to non-target species.

The rodent baits would be aerially broadcast from a hopper suspended under a helicopter, and by hand.

East Islet baiting would occur during the November thru December window and would be treated along with approximately 20 ha of Middle Islet to lower the probability of invasion by rats from Middle Islet to East Islet. The 20 ha section of Middle Islet may be treated intermittently to prevent re-invasion of East Islet. Middle Islet (including the section treated with East Islet ) and West Islet would be treated during the application window of November thru December in the year following East Islet application. Bait would be applied in the following formulation:

**Active Ingredients:** Diphacinone and Brodifacoum

Concentration of Active Ingredient:

- Diphacinone: 50 ppm
- Brodifacoum: 25 ppm

Rate of application:

- Diphacinone: 22-34 kg/ha
- Brodifacoum: 5-10 kg/ha

Application: The first application of diphacinone would be applied in two waves approximately 3-4 weeks apart.

Three to four weeks after final diphacinone application, the brodifacoum bait would be aerially broadcast at a rate of 5-10 kg/ha.

Application would be completed by hand or aerial broadcast across 100% of the area of the islands. Hand broadcast would be carried out with or under the supervision of licensed applicators spreading bait by hand. Aerial broadcast would be carried out utilizing a hopper (dry slinger) suspended from a helicopter flying along a predetermined pathway programmed into a Differential GPS.

Top of Island: Bait would be spread from a hopper suspended under a helicopter. The helicopter would fly at approximately 50 knots, approximately 25-50 m aboveground with the hopper open and spreading bait. To ensure even coverage, the island would be flown twice: once in an East-West direction sowing at half the rate, then again on a North-South direction sowing bait at half the rate. Bait would be spread from the hopper in a 360-degree pattern. The number of passes over the island would be determined by the swath width which is a function of size of the bait pellet and speed with which it is propelled out of the hopper.

Cliffsides: Every effort would be made to prevent bait drifting into the marine environment. The helicopter would fly along the top cliff edge to minimize drift of bait into the marine ecosystem. The treated area would be

a portion of the top of the island and the cliffsides. In some cases, hand broadcast bait onto the cliffsides from above, or and travel by boat to service the offshore rocks, islands, and lower reaches of the cliffsides may be necessary. The helicopter would be used to “trickle” bait the larger offshore rocks with the helicopter hovering low, hopper turned off- gate open to ensure adequate coverage.

Number of applications: A maximum of two applications is anticipated.

Timing:

- Year 1-2: Initiate eradication by baiting as prescribed in representative habitat during the Nov-Dec application window (either East Islet as a whole, or smaller area on Middle Islet) and conduct effectiveness and validation monitoring. Monitor results and determine if changes are necessary. *Year 1* activities may begin during the 2000 Nov-Dec application window given that necessary compliance measures are completed.
- Year 2-3: If monitoring results prove favorable, proceed with island-wide eradication activities.

Initiate broadcast of bait onto East Island and the 20 ha buffer of Middle Island. Initiate broadcast of bait onto Middle and West Island including the 20 ha buffer on Middle Island. If rats are detected on East Anacapa Island between year one treatment and year 2 treatment, the Rat Detection Response Plan may be implemented. If the problem evaluation demonstrates that rats are widespread on East Island, the whole island may be re-treated during the treatment of Middle and West Islands.

- *Year 2- Future:* If rats are detected, the Rat Detection Response Plan would be implemented (See Appendix A)

## *Alternatives Considered and Rejected*

### ***Bait Stations***

Under this alternative bait stations would have been placed on top as well as on cliffsides and shorelines of Anacapa Island. This was dismissed because of the steep topography and unstable cliffsides, would have made stations problematic. Moreover, vegetation would have been trampled and nesting pelicans disturbed. A detailed description of each reason follows.

Anacapa Island is composed of basalt and is partially volcanic in origin. As a result, the cliffsides are extremely unstable and rockfalls are not uncommon. The placement of bait stations would require project personnel to scale the cliffs using ropes. The instability of the cliffsides and high risk of rocks falling on, and severely injuring climbers resulted in this alternative being dismissed.

Bait stations would have to be serviced frequently by personnel, resulting in a high risk of erosion and trampling of native vegetation. A network of trails would be created that would result in long-term damage.

Disturbance to pelicans nesting on West Anacapa would be unavoidable because of the need to service bait stations. The pelicans are protected under the Endangered Species Act and regular disturbance could cause nest abandonment and nest failure resulting in low productivity.

### ***Elevated Bait Stations***

The use of elevated bait stations, designed by Erickson (1990) would have been used in any of the alternatives that required bait stations.

Erickson's (1990) laboratory study showed that only 93% (n=30) of roof rats could gain access to the bait in the stations. The purpose and need dictates that 100% be removed; therefore, elevated bait stations fail to meet the objective. In the field, rats were shown to readily use the stations; however, it was unclear if 100% of rats in the area were exposed to the bait. Although the elevated bait stations show promise for rat control where native mice are present, Erickson (1990) did not demonstrate that rats could be controlled or eradicated from Anacapa Island.

Using elevated bait stations would require personnel to dig PVC piping into the ground to support the stations. Where soil is present, PVC may be easily dug into the ground. However, Anacapa is very rocky (the majority of the island is exposed rock), thus digging holes for PVC would be near impossible. In addition to the logistical challenge the placement of stations across the islands and cliffsides would present, they also would cause disturbance to native vegetation and disturbance and possible damage to cultural sites (e.g. Chumash native middens, archaeological sites).

### ***Alternate Rodenticides***

The use of the other rodenticides registered with the US EPA were considered. The rodenticides were dismissed for one or more of the following reasons: 1) lack of proven effectiveness in island rat eradications; 2) potential for development of bait shyness in the rat population; 3) inability to cope with the potential "Warfarin resistant" rats; and 4) the unavailability of an antidote in case of human exposure. Each of these issues and the associated rodenticides are discussed below. For

a summary of the registered rodenticides considered, see Table 2.

Previous island wide eradication projects (for islands greater than 10 ha) have only utilized brodifacoum, bromadiolone, and warfarin (Table 2). Bromethalin was used in conjunction with brodifacoum on one island. None of the other rodenticides have been used for island eradications.

The use of bromethalin and zinc phosphide if used extensively, could result in the development of “bait shyness”. Bait shyness develops in a rat population when symptoms of exposure are associated with the bait presented such as bromethalin and zinc phosphide. Studies have demonstrated that even with pre-baiting, only 60- 70% of rats would be controlled with an acute rodenticide (Lund 1988). Any individual rat that survives a round of exposure is likely to avoid the bait in the future (Record and Marsh 1988). If rats were to survive a baiting application on Anacapa Island, the effort required to remove those individuals would be greater than if a non-acute rodenticide which does not induce bait shyness was used. Cholecalciferol may also lead to “bait aversion” because of the high concentrations in the final bait formulations (Prescott et al. 1992 in Kaukeinen et al. 2000)

An attempt to control and/or eradicate rats from Anacapa Island was carried out over a number of years in the 1980s and early 1990s. Many control methods were attempted including delivery of Warfarin via bait stations. The control of rats can be a strong selection agent, increasing the frequency of rats that cannot be killed via the control method used. Where populations of rats have been previously exposed to poison, some rats demonstrate bait avoidance behavior and others may be biochemically “resistant” to the anticoagulant used.

It is unknown if the population of rats on Anacapa Island contain individuals that would demonstrate bait shyness or are “Warfarin-resistant”. If rats are resistant to Warfarin, the amount of bait used would require greater and greater amounts of warfarin to induce a toxic effect. It may be that “Warfarin resistant” individuals are insensitive to the other first generation anticoagulants such as diphacinone and chlorophacinone (Greaves 1994). Even if warfarin resistance is not present in a rat population, the use of first generation anticoagulants may not induce 100% mortality of the target species under standard EPA laboratory efficacy studies.

The use of rodenticides in the field does pose some degree of risk, albeit small (due to the fact that humans would have to intentionally ingest the bait, in large quantities to do harm), to humans on the islands. On Anacapa Island, bait would be applied to East Island, which visitors frequent, so there is some potential for visitors to be exposed to any rodenticide. However, the exposure to human visitors is extremely low. All of the rodenticides represent a risk of exposure. However, most have an antidote (Vitamin K1 for the anticoagulants, and calcitonin for cholecalciferol) which counteract the activity of the rodenticide. Of the acute rodenticides, symptoms would be measurable soon after ingestion. If sufficient quantities were consumed, immediate intervention would be required including medical evacuation. A major disadvantage of the acute rodenticides, from a human health perspective, is the lack of an antidote.

Table 2. Characteristics of rodenticides registered with the US EPA

| Rodenticide     | Category                        | Previous Success in Island Restoration | Activity    | Ability to Induce Bait Avoidance <sup>a</sup> | Danger to Humans | Antidote Available? |
|-----------------|---------------------------------|--|-------------|---|------------------|---------------------|
| Brodifacoum     | Second Generation Anticoagulant | High                                   | Single Feed | Very Low                                      | Low              | Yes                 |
| Difethialone    | Second Generation Anticoagulant | No Data                                | Single Feed | Very Low                                      | Low              | Yes                 |
| Bromadiolone    | Second Generation Anticoagulant | Low                                    | Single Feed | Very Low                                      | Low              | Yes                 |
| Chlorophacinone | First Generation Anticoagulant  | No Data                                | Multi-Feed  | Low   | Low              | Yes                 |
| Diphacinone     | First Generation Anticoagulant  | No Data                                | Multi-Feed  | Low   | Low              | Yes                 |
| Warfarin        | First Generation Anticoagulant  | Low                                    | Multi-Feed  | Low   | Low              | Yes                 |
| Bromethalin     | Subacute                        | Low                                    | Single Feed | High  | High             | No                  |
| Cholecalciferol | Subacute                        | No Data                                | Single Feed | Possible                                      | Moderate         | Yes                 |
| Zinc Phosphide  | Acute                           | No Data                                | Single Feed | High  | High             | No                  |

<sup>a</sup> See text for definition

## Trapping

This alternative would have used live traps and/or kill (snap) traps to eradicate rats from Anacapa Island. This alternative was dismissed because it failed to meet the purpose and need and is technologically infeasible.

The use of live traps and/or kill traps to remove rats from an area is a strong selection agent and selects for rats that are “trap shy”. Thus, the frequency with which rats are trapped

decreases with the increasing effort of trap placement. Therefore, a prohibitive financial and time investment would be required to trap the few remaining rats from Anacapa Island. This technique has not been successfully used on other islands and likely would result in a large control program that, in effect, would harvest the surplus rats.

The implementation of a trapping regime on Anacapa Island would require substantial labor and subsequent financial investment. Traps

would have to be laid on the cliffsides and shoreline of the island to be successful. Staff servicing traps would be placed at risk of encountering numerous vector bone diseases from handling rodents and used traps. The effects of personnel scaling the cliffs has been discussed in the first alternative considered but dismissed (see above). There is also the high probability of capturing non-target species such as landbirds, seabirds and mice in the traps. Therefore, this alternative is infeasible to implement.

### ***Introducing Predators***

This alternative is one form of biological control that was recommended during the scoping period. The introduction of predators such as snakes and cats was recommended; however, this was dismissed because it fails to meet the purpose and need. It also would result in unreasonable damage to the environment, and does not conform to the Park's General Management Plan.

The introduction of cats to islands in order to control introduced rats has been attempted numerous times since European explorers began crossing the Atlantic and Pacific Oceans in search of riches. The introduction of a predator such as cats to control rats usually results in a greater impact on birds than if one or the other were present alone. When seabirds are present, cats have been demonstrated to prey heavily on seabirds (Keitt 1998, Atkinson 1985) taking fewer rats. When the seabirds leave the island, the cats turn to rats which artificially maintain the population at a higher level than if the rats were not present (Atkinson 1985). Thus, birds are impacted by both rats and the larger number of cats present due to the rats. Introduction of another species into an island ecosystem can have severe and permanent consequences (see Quammen 1996). The introduction of non-native species has been identified as the leading

cause of species extinctions on islands (Tershy et al. 1997).

### ***Summary of Alternatives***

A summary of the major features of each alternative can be found in Table 3. The environmental impacts of implementing each alternative are discussed in Chapter Four. The alternatives differ in their approach to distribution of a rodenticide (aerial, bait station) across the island and the active ingredients used in the rodent bait.

Table 3. Summary of Alternatives for the Anacapa Island Restoration Project.

| Alternative   | East Anacapa |        | Middle Anacapa |        | West Anacapa |        | Active Ingredient           | Concentration (ppm) |
|---------------|--------------|--------|----------------|--------|--------------|--------|-----------------------------|---------------------|
|               | Top          | Cliff  | Top            | Cliff  | Top          | Cliff  |                             |                     |
| 1 (No Action) | NA           | NA     | NA             | NA     | NA           | NA     | NA                          | NA                  |
| 2 (Preferred) | Aerial       | Aerial | Aerial         | Aerial | Aerial       | Aerial | Brodifacoum                 | 25                  |
| 3             | Bait Stn     | Aerial | Bait Stn       | Aerial | Aerial       | Aerial | Brodifacoum                 | 25                  |
| 4             | Aerial       | Aerial | Aerial         | Aerial | Aerial       | Aerial | Bromadiolone                | 50                  |
| 5             | Bait Stn     | Aerial | Bait Stn       | Aerial | Aerial       | Aerial | Bromadiolone                | 50                  |
| 6             | Aerial       | Aerial | Aerial         | Aerial | Aerial       | Aerial | Diphacinone and Brodifacoum | 50 and 25           |